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(54) PIGMENT-COATED PAPER FOR PRINTING AND ITS PRODUCTION

## (57)Abstract:

PURPOSE: To obtain pigment-coated paper for printing excellent in smoothness and surface properties without causing printing unevenness.

CONSTITUTION: The objective pigment-coated paper for printing is obtained by regulating the smoothness of an undercoating layer measured with a smoothness tester Smooster (R) to  $\pm 80\text{mmHg}$  and coating the paper with a curtain coater as a coater for the topmost layer. Furthermore, the objective method for producing the pigment-coated paper is provided.

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Claim(s)]

[Claim 1] Pigment coated paper for printing which the \*\*\*\*\* star smoothness of the under coat application layer to which the best layer is applied is 80 or less mmHgs in the pigment coated paper for printing which has the application layer which makes a principal component the pigment and adhesives more than two-layer at least, and is characterized by applying the best layer using a curtain coater.

[Claim 2] The manufacture technique of the pigment coated paper for printing which applies to stencil paper the under coat application layer to which the best layer is applied in the manufacture technique of the pigment coated paper for printing of having the application layer which makes a principal component the pigment and adhesives more than two-layer at least, sets \*\*\*\*\* star smoothness of this under coat application layer to 80 or less mmHgs, and is characterized by applying the best layer on this under coat application layer using a curtain coater.

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the pigment coated paper for printing and the manufacture technique which are acquired by the curtain coater about the pigment coated paper for printing, and its manufacture technique.

[0002]

[Description of the Prior Art] Conventionally, as compared with the paper of fine quality of a non-coating, since the absorptivity of smooth nature and ink is uniform, pigment coated paper is widely used as a print sheet. Especially visualization of recent years and printed matter progresses, and the proportion of color printing increases, and increase of a print speed progresses, and the demand to a print sheet is also higher.

[0003] Although there are many demand qualities to a print sheet, application \*\*\*\* of the field where that smooth nature is high especially, excelling in the manifestation of gloss, and printing are performed is uniform, and it is important that there is no application defect and that printing nonuniformity does not occur.

[0004] Although it goes over the method of application of the print sheet which performs a pigment application variably, specifically, the blade applying method, the air knife applying method, and the roll applying method can be mentioned. It is being able to apply the application liquid which is the easy operation in comparison and makes a pigment a principal component as a characteristic feature with which these applying methods' were common. However, a quality print sheet was not able to be obtained in these application methods.

[0005] That is, the blade applying method is a method of applying a post-measurement type which fails to scratch excessive liquid with a blade, after supplying application liquid to a web superfluously. However, by such applying method, since the water or the binder component in application liquid permeates beyond the need at a web and a high pressure is applied to application liquid directly under [ at the time of measurement / blade ] in between from supply of surplus liquid to measurement, permeation to the water in application liquid or the web of a binder component advances still notably. For this reason, since a binder component decreases relatively, a coated layer intensity becomes low and it is hard coming to be discovered of high gloss in a pigment application layer. Moreover, the product of the quality which composition of application liquid changed with the passage of time, and was stabilized unlike composition of the liquid before supply as a part for a surplus by the liquid which failed to be scratched cannot be obtained. Moreover, if the application liquid which makes a pigment a principal component is applied by such applying method, occurrence of application defects, such as a streak and a scratch, is unescapable.

[0006] The air knife applying method is a method of applying a post-measurement type which fails to scratch excessive liquid with a wind pressure, after supplying application liquid to a web superfluously. Such an applying method tends to generate a pattern peculiar to an air knife in an application layer, and by this, the smoothness of the front face of an application layer falls remarkably, and a quality not only deteriorates, but it serves as a serious failure also at the time of printing. Moreover, in such a method of application, if it enlarges a wind pressure although it is necessary to make a wind pressure high when high-speed-izing an application speed, or in high-concentration-izing liquid concentration, occurrence of such a pattern not only becomes still remarkable, but turbulence of flowing of an airstream will occur and the ambient noise by the blowdown will become remarkable. therefore, since a wind pressure cannot be enlarged at \*\* et al., it is not suitable for a manufacture of the pigment coated paper demanded for it to be comparatively alike and to apply hyperviscous liquid at high speed

[0007] The roll applying method has the common method of application which \*\*\*\*s liquid by imprint of the application liquid during a roll combining two or more rolls, and is fundamentally imprinted to a web, although the thing of various formats exists with the combination of a roll etc.

Such a method of application is difficult for being easy to generate a pattern peculiar to a roll, and the gloss of an application side and smooth nature falling in the case of the sublation after an imprint of an application roll side and a web, and filling the demand quality to a print sheet in recent years.

[0008] The curtain applying method is the applying method which solves the problem in these air knife or the blade applying method. However, by the curtain applying method, there is no scratch dropping, and since the thickness of the curtain layer with uniform thickness is reflected in the thickness of an application layer as it is, the configuration on the front face of a web where an application is performed will do the serious influence for the configuration of the front face of the application layer by which the curtain application was carried out. Therefore, in a curtain application, when the smoothness on the front face of a web is low, un-arranging [ to which the smoothness of a final application layer becomes low ] arises.

[0009]

[Problem(s) to be Solved by the Invention] The purpose of this invention is realizing by setting to 80 or less mmHg's \*\*\*\*\* star smoothness of the under coat application side to which a manufacture of the quality high pigment coated paper for printing of the smoothness which cannot be realized, and efficient coexistence of a production are applied using a curtain application method in an air knife application method, a blade application method, and a roll application method.

[0010]

[Means for Solving the Problem] It finds out that this invention is obtained under the stable operating condition in the quality high pigment coated paper for printing of smoothness by setting to 80 or less mmHg's \*\*\*\*\* star smoothness of the under coat application layer to which an application of the best layer is given in the pigment coated paper for printing, and performing an application of the best layer using a curtain coater.

[0011] That is, the granularity with the detailed front face represented with the curtain applying method by the smoothness of the under coat application layer to which an application of the best layer is given since the thickness of the curtain layer with uniform thickness is reflected in the thickness of an application layer as it is does the serious influence for the smooth nature of the front face of the best layer, gloss, etc. That is, if smoothness of an undercoat application layer is made high, the smoothness and the glossiness of the best layer can improve and can acquire a desirable property as pigment coated paper for printing. Here, when the smoothness of undercoat, and the smoothness and the glossiness of the best layer were examined zealously, the best layer came to find out especially that desirable smoothness is obtained as pigment coated paper for printing by setting \*\*\*\*\* star smoothness of undercoat to 80 or less mmHg's.

[0012] Moreover, the smoothness of undercoat is the fraction into which it not only affects the glossiness and smoothness of the best layer, but a curtain layer collides with a web and an application is materialized, and has a close relation to the amount of the air accompanied between an application layer and a web layer. That is, when the smoothness of undercoat is low, a disturbance of air tends to happen on a web layer front face, as a result, a company air content increases and the phenomenon in which the foam remains in an application layer is observed. This is not desirable as a property of the pigment coated paper for printing. It is [0013] which came to find out stopping observing the foam of the best layer resulting from the air which accompanied the \*\*\*\*\* star smoothness of undercoat to the web by being referred to as 80 or less mmHg's when the amount of the air accompanied to the smoothness and the best layer of undercoat is examined further here. Although characterized by applying the application liquid which made a pigment and adhesives the principal component like the above in this invention using a curtain coater When \*\*\*\*\* star smoothness applies to the web which prepared the under coat application layer of 80 or less mmHg's by curtain application There is no occurrence of an application fault, stable application operation can be performed, a coverage is uniform and what indicated the technique of obtaining the high pigment coated paper for printing of smooth nature is not yet found.

[0014] Hereafter, based on an accompanying drawing, the embodiment of this invention is explained

in detail. Drawing 1 is a schematic diagram of the coater for the pigment coated paper application for printing which showed the embodiment of this invention. From the application liquid storage tank 11, the application liquid prepared beforehand is sent to the coating-machine head 1 with the liquid supply pump 12. In this case, since the amount of liquid sending of application liquid is in the coverage and proportionality of a final product, it is necessary to perform the amount control of liquid sending of the application liquid to the coating-machine head 1 with a sufficient precision. So, as a liquid supply pump 12, the amount [ of variable flows ] type flow rate pump constant [ non-rippled ] is suitable.

[0015] The interior of the coating-machine head 1 consists of a manifold 6 and a slit 2, and respectively highly precise finishing is given. The supplied application liquid is filled by the manifold 6, in the narrow clearance through which it passes when further sent to a slit 2, the influence of the dynamic pressure by liquid sending of the liquid supply pump 12 is mitigated, the pressure distribution in the cross direction are equalized, and it flows out from a lip 3, and forms the perpendicular curtain layer 4.

[0016] The perpendicular curtain layer 4 with which the profile became uniform crosswise contacts the web 5 which is carrying out the continuity run, and is applied to a web 5. The edge guides 10a and 10b do not exceed the width of face of the coating-machine head 1 here, but the width of face of a web 5 is exceeded further, and it is prepared, and a perpendicular curtain layer exceeds the width of face of a web 5, and is formed. The perpendicular curtain layer 4 exceeds the width of face of a web 5, and it is formed for preventing thick coating of the coated layer in the both ends of the perpendicular curtain layer 4. The application liquid which exceeds the width of face of a web 5 and flows down is collected by the liquid receiver 9, and after returning to the application liquid storage tank 11, it is applied again. Moreover, application liquid is collected by the liquid receiver 9, when a web 5 cuts and an application is interrupted.

[0017] The airstream accompanied to a web 5 at the contact section (it is henceforth called the "application section".) of the web 5 and the perpendicular curtain layer 4 which are carrying out the continuity run is covered, and \*\*\*\*\* 8 is formed in order to reach a web 5, without confusing the perpendicular curtain layer 4 by the time style of the air of the curtain circumference etc. Moreover, by changing the course with a roll 7 just before the application section, the conveyance orientation of a web 5 is constituted so that the influence of the application section on the air accompanied to a web 5 may be minimized.

[0018] Although the height from a web 5 to the outflow section of the coating-machine head 1 lower part is needed to some extent in order to apply the perpendicular curtain layer 4 made to form in the status that it was stabilized, it is also possible to control the height in this embodiment, and the height suitable for the stability of the perpendicular curtain layer 4 is 120-180mm still preferably 100-250mm preferably 60-300mm.

[0019] this invention cannot be overemphasized by that various deformation is possible, without being limited to the above embodiment. Although width of face of the formed curtain layer was made into size from the width of face of a web 5 in the embodiment mentioned above This is for preventing the increase in the coverage in application layer both ends. When such an increase in a coverage is smallness or it seldom considers as a problem, Or when it can cancel by adopting the technique indicated by JP,49-14130,B etc., in addition the increase prevention technique in a coverage, a perpendicular curtain layer is made in agreement with the width of face of a web 5, or it does not interfere as smallness somewhat from this.

[0020] Moreover, it is also possible to attach a profile adjustment device or a controlling mechanism to a curtain head. When the opening profile adjustment device was attached to the slit 2 especially shown in drawing 1 and especially application width of face becomes large, a more uniform coverage profile can be obtained crosswise.

[0021] In this invention, the application liquid which makes a pigment a principal component is the liquid water was made to melt or distribute with a pigment, a binder, in addition an additive, and the

solid-content concentration of a pigment, a binder, in addition an additive says 10 - 70% of the weight of a thing. As for the blending ratio of coal of a pigment and a binder, it is desirable that a binder is generally 10 - 70 weight section preferably more than 5 weight section to the pigment 100 weight section.

[0022] As a pigment for coated paper used by this invention, a kaolin, clay, a calcium carbonate, a satin white, titanium oxide, an aluminum hydroxide, a zinc oxide, a barium sulfate, a calcium sulfate, a silica, the activated clay, a lake, a plastics pigment, a binder pigment, etc. are mentioned.

[0023] As a binder used for this invention, a styrene butadiene system, Vinegar \*\* and acrylic, ethylene and a vinegar \*\* system, a butadiene methyl methacrylic system, Various copolymers, such as a vinegar \*\* butyl acrylate system, polyvinyl alcohol, Synthetic system adhesives, such as a maleic-anhydride copolymer, an isobutene and a maleic-anhydride copolymer, and an acrylic acid, a methyl methacrylate system copolymer, The adhesives generally known, such as natural system adhesives, such as an oxidized starch, a etherification starch, an esterification starch, a cold-water soluble starch that carries out flash plate dry cleaning of an enzyme denaturation starch or them, and is obtained, casein, and soybean protein, are mentioned. Moreover, the various assistants blended with the usual pigment application liquid for coated paper, such as a thickener, a water retention agent, a deck-watertight-luminaire-ized agent, and a coloring agent, can use it suitably if needed.

[0024] As for the application constituent of this invention obtained in this way, both sides or one side of a web of 80 or less mmHgs is coated with \*\*\*\*\* star smoothness. To the application of the lower layer section in a multilayer application, use of coaters other than a curtain coater is also possible.

[0025] As a web used by this invention, if \*\*\*\*\* star smoothness is 80 or less mmHgs, what prepared the under coat application layer is included in the paper of fine quality generally used, a report grade paper, \*\*\*\*, a machine coat paper, an art paper, cast-coated paper, a synthetic paper, resin coated paper, and a plastic film unexceptional.

[0026] When the \*\*\*\*\* star smoothness of an under coat application layer exceeds 80mmHgs, data is smoothed, and it is possible to set \*\*\*\*\* star smoothness to 80 or less mmHgs, and calender processing of a supercalender, a soft calender, etc. is usually performed as the means.

[0027] It is dry weight canon and the coverage of the application liquid which makes a principal component the pigment and adhesives which are used for the best layer or an under coat application layer in this invention is 1g/m<sup>2</sup>. It is 3-30g/m<sup>2</sup> preferably above. It is suitable.

[0028]

[Function] In this invention, \*\*\*\*\* star smoothness of the under coat application layer to which the best layer is applied can be set to 80 or less mmHgs, and the quality high pigment coated paper for printing of smooth nature can be obtained under the stable operating condition by performing an application of the best layer using a curtain coater.

[0029]

[Example] Hereafter, an example is hung up in order to make the effect of this invention much more clear. In addition, as long as all number of copies in an example shows the weight section and there is no notice especially, concentration shows weight [ of solid-content concentration ] %, and a coverage shows a xeransis coverage.

[0030] 60g of example 1 basis weights/, and m<sup>2</sup> To paper of fine quality, a coverage is 10g/m<sup>2</sup> by the curtain coater. The solid-content concentration of the following combination applied the application liquid which is 45% by 1000m in application speed, and min as under coat liquid, and produced under coat application layer coating stencil paper (it abbreviates to under coat stencil paper hereafter) so that it might become. In addition, the \*\*\*\*\* star smoothness of the under coat application side at this time was 130mmHg.

[0031]

An under coat application liquid combination marketing whiting (car \*\*\*\*\* 90) The 2nd class kaolin of 70 section marketing (\*\*\*\*\* light) 30 section marketing polyacrylic-acid system dispersant 0.2 section marketing phosphorylation starch 9 section marketing styrene butadiene latex 8

section sodium hydroxide The 0.1 sections [0032] The curtain coater was used for this under coat stencil paper, an application and xeransis were performed so that a coverage might be set to 15g/m<sup>2</sup> at the application speed of 800m/min, the finishing application liquid whose solid-content concentration is 48% was produced by the following combination, calender processing of the under coat stencil paper obtained before was carried out, smoothness was set to 29mmHg, and the pigment coated paper for printing was obtained.

[0033]

A finishing application liquid combination marketing whiting (car \*\*\*\*\* 90) The 1st class kaolin of 20 section marketing (ultra white 90) 70 section marketing satin white 10 section marketing polyacrylic-acid system dispersant 0.2 section marketing phosphorylation starch 3 section styrene butadiene latex The 18 sections [0034] Except having carried out calender processing of the under coat stencil paper obtained in the example 2 example 1, and having set \*\*\*\*\* star smoothness to 73mmHg, it is the same technique as an example 1, and the pigment coated paper for printing was obtained.

[0035] Except having carried out calender processing of the under coat stencil paper obtained in the example of comparison 1 example 1, and having set \*\*\*\*\* star smoothness to 88mmHg, it is the same technique as an example 1, and the pigment coated paper for printing was obtained.

[0036] Except having not carried out calender processing of the under coat stencil paper obtained in the example of comparison 2 example 1, it is the same technique as an example 1, and the pigment coated paper for printing was obtained.

[0037] Calender processing of the under coat stencil paper obtained in the example of comparison 3 example 1 is carried out, \*\*\*\*\* star smoothness is set to 32mmHg, a blade coater is used for this under coat stencil paper, and a coverage is the finishing application liquid of an example 1 at the application speed of 800m/min 15g/m<sup>2</sup> An application and xeransis were performed so that it might become, and the pigment coated paper for printing was obtained.

[0038] Calender processing is not carried out to the under coat stencil paper obtained in the example of comparison 4 example 1, but a blade coater is used, and a coverage is the finishing application liquid of an example 1 at the application speed of 800m/min 15g/m<sup>2</sup> An application and xeransis were performed so that it might become, and the pigment coated paper for printing was obtained.

[0039] Calender processing of the under coat stencil paper obtained in the example of comparison 5 example 1 is carried out, \*\*\*\*\* star smoothness is set to 32mmHg, an air knife coater is used for this under coat stencil paper, and a coverage is the finishing liquid of an example 1 at the application speed of 250m/min 15g/m<sup>2</sup> An application and xeransis were performed so that it might become, and the pigment coated paper for printing was obtained.

[0040] Calender processing is not carried out to the under coat stencil paper obtained in the example of comparison 6 example 1, but an air knife coater is used, and a coverage is the finishing liquid of an example 1 at the application speed of 250m/min 15g/m<sup>2</sup> An application and xeransis were performed so that it might become, and the pigment coated paper for printing was obtained.

[0041] All the obtained pigment coated paper was evaluated after performing calender processing on the same conditions.

[0042] The \*\*\*\*\* star smoothness of the <evaluation technique 1 of pigment coated paper> application layer was measured with the \*\*\*\*\* star smoothness testing machine (\*\*\*\* electronic industry incorporated company make, formal SM-6A). (Unit:mmHg)

[0043] Evaluation of the <evaluation technique 2 of pigment coated paper> printing nonuniformity was wetted in the Roland offset press, was printed on condition that the excess of water, and was left at the room temperature one whole day and night, and viewing performed it about the printing section whose rate of area of the half tone dot of the monochrome of the cyanogen of a sample is 50%. (5 is most excellent in unit:5 phase evaluation)

[0044] Evaluation of the <evaluation technique 3 of pigment coated paper> application \*\*\*\* performed arbitrary sites by visual decision. When application \*\*\*\* was conspicuous when almost

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good, O and, and completely uniform and \*\* and unevenness were [ being O and / uneven / a little / and ] conspicuous, it was judged as x.

[0045] The fault detection equipment installed in the coater performed the detection of the <evaluation technique 4 of pigment coated paper> application fault, and the length of a fault to an application length estimated. Application faults detectable [ with fault detection equipment ] are the overapplication sections with non-applied fractions, such as a streak and a scratch, such as a fault and dirt, and a detection is detectable if width of face is a thing 0.3mm or more. In consideration of a margin in case the length of a fault deletes the fault section, as for the length of a fault, the length with a fault actual as a length which added 1m before and after the fault is set to 2.1m by even the 0.1m case.

[0046]

[Table 1]

	塗工 方式	下塗層 平滑度 [mmHg]	上塗層 平滑度 [mmHg]	印刷ムラ [5段階]	塗布 面質	塗布 欠点 [%]
実施例 1	カーテン	29	6	5	◎	0
" 2	"	73	7	4	◎	0
比較例 1	"	88	11	4	○	0
" 2	"	130	24	3	△	0
" 3	エアナイフ	32	26	3	△	0.6
" 4	"	130	29	2	×	0.5
" 5	プレート	32	12	4	○	2.4
" 6	"	130	14	3	○	1.3

[0047] Although the evaluation result as shown in the <evaluation result> table 1 was obtained, at a blade coater, occurrence of a streak is conspicuous and the quality which \*\*\*\* may have is not obtained by the air knife coater. When a curtain coater is used and the \*\*\*\*\* star smoothness of under coat stencil paper exceeds 80mmHg, the smoothness which may be satisfactory and application \*\*\*\* of what occurrence of an application fault is not regarded as are not obtained. That is, using a curtain coater, \*\*\*\*\* star smoothness of under coat stencil paper is set to 80 or less mmHgs, it excels in smooth nature and \*\*\*\* by applying the pigment coated paper for printing, and the quality pigment coated paper for printing without occurrence of printing nonuniformity can be obtained.

[0048]

[Effect of the Invention] Using a curtain coater, by setting \*\*\*\*\* star smoothness of under coat stencil paper to 80 or less mmHgs, it excels in smooth nature and \*\*\*\*, and, according to this invention, the quality pigment coated paper for printing without occurrence of printing nonuniformity can be obtained efficiently.